RESONATOR PIECE, RESONATOR, OSCILLATOR AND ELECTRONIC DEVICE

BACKGROUND OF THE INVENTION

1. Field of Invention

[0001] The present invention relates to a resonator piece comprising, for example, crystal, a resonator including the resonator piece, an oscillator disposed with the resonator, and an electronic device.

2. Description of Related Art

[0002] Conventionally, a crystal tuning fork resonator piece, which is, for example, a resonator piece, is configured as shown, for example, in Fig. 9. The crystal tuning fork resonator piece 10 includes a base portion 11 and two arm portions 12 and 13 that are formed so as to project from the base portion 11. Additionally, grooves 12a and 13a are disposed in the two arm portions 12 and 13. The grooves 12a and 13a are similarly disposed on back surfaces of the arm portions 12 and 13 that are not shown in Fig. 9.

[0003] For this reason, as shown in Fig. 10, which is a cross-sectional view along E-E' of Fig. 9, the arm portions 12 and 13 are formed so that the cross-sectional shapes thereof have substantial "H" shapes. The substantially H-shaped crystal tuning fork resonator piece 10 has the characteristic that, even if the size of the resonator piece is made significantly compact than the conventional piece, resonation loss of the arm portions 12 and 13 is kept low and the CI value (crystal impedance or equivalent series resistance) can also be kept low.

[0004] For this reason, the substantially H-shaped crystal tuning fork resonator piece 10 is particularly suited, for example, for a resonator of which compactness and high-precision performance are demanded. As this resonator, there is a compact resonator or the like whose resonance frequency is, for example, 32.768 kH, and using the substantially H-shaped crystal tuning fork resonator piece 10 as a resonator piece in this resonator is being investigated. Additionally, a compact resonator or the like whose resonance frequency is 32.768 kH will eventually be incorporated and used in precision equipment, suchas watches and the like.

[0005] When a current is applied from the outside to the above mentioned substantially H-shaped crystal tuning fork resonator piece 10, the arm portions 12 and 13 resonate. Specifically, groove electrodes are formed in the grooves 12a and 13a shown in Figs. 9 and 10, and side surface electrodes are formed in both side surfaces 12b and 13b,

OK to enter. TMD 4-19-06